CRUISE REPORT

FE-00-06-GR

Leg 4 - 17-21 April 2000
Leg 5 - 24-28 April 2000

11 May 2000

Submitted to:
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Introduction

In April 2000, the National Centers for Coastal Ocean Science (NCCOS) initiated a new project funded by the National Marine Sanctuary Program: *Support of Monitoring Activities and Site Characterization at Grays Reef National Marine Sanctuary (GRNMS).* Three NCCOS Centers are involved in the work: the Center for Coastal Fisheries and Habitat Research (CCFHR), the Center for Coastal Environmental Health and Biomolecular Research (CCEHBR) and the Center for Coastal Monitoring and Assessment (CCMA).

The overall project has eight goals.

1) Participate in GRNMS fish monitoring activities including work in adjacent deeper areas.
2) Analyze fish monitoring data for changes in abundance and species composition over time (1995-1999).
3) Assess adequacy of fish monitoring sampling design for detecting changes in abundance and composition of fishes over time.
4) Determine the importance of non-reef habitats to juvenile stages of reef fishes and evaluate the linkages between non-reef and reef habitats.
5) Provide an assessment of the condition of macroinfaunal assemblages, concentrations of chemical contaminants in sediments, and contaminant body-burdens in target benthic species of the GRNMS.
6) Provide customized satellite-derived sea surface temperature products to assist research and management activities within GRNMS.
7) Determine the species of fish that spawn in the vicinity of GRNMS.
8) Evaluate larval transport to and dispersal from GRNMS to surrounding areas

The research conducted during FE-00-06-GR Leg 4 and Leg 5 contributed to goals 1, 4, 7, and 8.

Scientific Objectives

Work during FE-00-06-GR was piggybacked with work planned by GRNMS staff; their cooperation and accommodation made this work possible. The scientific objectives of the cruise follow the scientific goals of the project overall.

1) Conduct fish monitoring efforts in GRNMS during Leg 4.
2) Collect CTD measurements and ichthyoplankton samples for examining spawning and larval transport within the vicinity of GRNMS.
3) Deploy satellite-tracked drifters to examine the potential fate of fish larvae spawned within GRNMS.
4) Collect remotely operated vehicle (ROV) and beam trawl samples over non-reef habitats to quantify habitat characteristics and to examine juvenile fish, their predators and prey associated with these habitats.

The cruise plan involved two legs. During Leg 4, fish monitoring diving operations were planned for the day and CTD and bongo operations were planned for the night. At each site, a diver conducted a point count in a 5 m^2 radius around the fixed station marker. Four divers participated in fish monitoring at fixed site stations in GRNMS: Roger Mays (NOAA NOS CCFHR), Tom Potts (NOAA NURC), Jim Bohnsack and Jack Javech (NOAA NMFS Miami Laboratory).

Bongo (61 cm paired frame) and CTD (SBE-19) collections were planned on an along-shelf transect and a cross-shelf transect that bisected GRNMS (Figure 1). Each transect was sampled twice (Figure 1). Transect 1 and 3 were across-shelf and transect 2 and 4 were along shelf. At each station a CTD cast was made to the bottom and an oblique bongo tow was made with a minimum tow time of 5 minutes. Participants were Jon Hare and Harvey Walsh (NOAA NOS CCFHR).

During Leg 5, ROV and beam trawl (2 m) work was planned along a cross-shelf transect which included four stations around the perimeter of GRNMS (Figure 1). In addition,

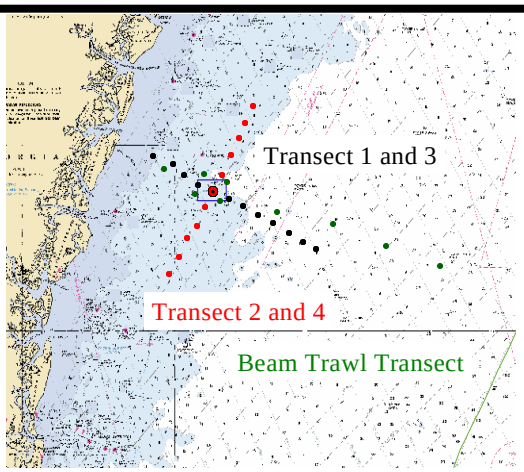


Figure 1. Map showing location of along shelf (red; transects 2 and 4) and across-shelf (black; transects 1 and 3) CTD/Bongo stations and across-shelf Beam Trawl/ ROV/CTD/Bongo stations (green)

CTD and Bongo collections were planned at each beam trawl/ROV station. ROV samples consisted of 2 15 min drifts through the station. Beam trawl stations consisted of 3, 5 min tows at each site with a 2 m beam trawl. CTD and Bongo operations were conducted as described above. Participants included John Burke (NOAA NOS CCFHR), Harvey Walsh (NOAA NOS CCFHR) and Lance Horne (NOAA NURC).

Accomplishments

Fish Monitoring - Point counts were made at all 20 fixed sites in GRNMS. Six sites were counted independently by two divers. One site was counted by all divers. The remaining 13 sites were counted by one diver. Three transects were also run for a total of 32 diver counts.

A total of 2140 fish were counted belonging to 30 taxa. A summary of these counts is provided in Table 1. Data has been computerized and is being analyzed with previously collected monitoring data.

Table 1. Summary of fish monitoring data collected during FE-00-06-GR-Leg 4

Common Name	Number Individuals Counted	Number of Sites Species Counted	Number of Sites Counted
Tomtate	642	6	32
Slippery Dick	587	32	32
Belted Sandfish	295	29	32
Spadefish	176	7	32
Unidentified Early Juvenile	100	1	32
Sheepshead	83	8	32
Black Sea Bass	77	24	32
Spottail Pinfish	67	10	32
Whitebone Porgy	17	7	32
Bank Sea Bass	15	9	32
Cocco Damselfish	14	12	32
Blue Angelfish	13	8	32
Gag grouper	11	6	32
Cubbyu	7	2	32
Red Snapper	7	4	32
Scamp Grouper	7	5	32
Bridle Goby	3	1	32
Scrawled Cowfish	3	1	32
Seaweed Blenny	3	2	32
Sand Perch	2	1	32
Bandtail Puffer	2	2	32
Unidentified Flounder	1	1	32
White Grunt	1	1	32
Crested Blenny	1	1	32
Planehead Filefish	1	1	32
Sand Tiger Shark	1	1	32
Leopard Toadfish	1	1	32
Spanish/King Mackerel	1	1	32
Checkered Blenny	1	1	32
Unidentified Stingray	1	1	32

Two collections of small post-settlement stage fish were made. Approximately 20 individuals were captured: ~15 spottail pinfish (*Diplodus holbrooki*) and ~5 grunts (*Haemulon* spp.). Their sizes ranged from 10-25 mm.

Bongo Collections - A total of 50 Bongo tows were made - 46 during Leg 4 and 4 during Leg 5. Summary of Bongo data collected is shown in Table 2 and 3.

Table 2. Summary of Bongo and CTD collections made during FE-00-06-GR Leg 4

Cruise	Sta	Tran	Day	Mo	Year	Gear	Mesh	Time	Dur	Flow N1 End	Flow N1 Beg	Flow N2 End	Flow N2 Beg	CTD
FE-00-06-GR-Leg4	1	1	17	4	2000	60-Bongo-OBL	505	2218	513	6494	991748	764006	751067	Yes
FE-00-06-GR-Leg4	2	1	17	4	2000	60-Bongo-OBL	505	2258	500	22903	6540	779094	763990	no
FE-00-06-GR-Leg4	3	1	17	4	2000	60-Bongo-OBL	505	2342		43851	22903	799690	779100	Yes
FE-00-06-GR-Leg4	4	1	18	4	2000	60-Bongo-OBL	505	30		62624	43933	817458	799690	Yes
FE-00-06-GR-Leg4	5	1	18	4	2000	60-Bongo-OBL	505	113	553	79734	62638	834319	817461	Yes
FE-00-06-GR-Leg4	6	1	18	4	2000	60-Bongo-OBL	505	151	523	93806	79799	847840	834319	Yes
FE-00-06-GR-Leg4	7	1	18	4	2000	60-Bongo-OBL	505	228	503	107976	93933	861840	847839	Yes
FE-00-06-GR-Leg4	8	1	18	4	2000	60-Bongo-OBL	505	304	500	122592	107977	876299	861841	Yes
FE-00-06-GR-Leg4	9	1	18	4	2000	60-Bongo-OBL	505	336	450	134304	122592	887832	876299	Yes
FE-00-06-GR-Leg4	10	1	18	4	2000	60-Bongo-OBL	505	411		146737	134304	899564	887831	Yes
FE-00-06-GR-Leg4	11	1	18	4	2000	60-Bongo-OBL	505	435	526	162342	146730	913338	899571	Yes
FE-00-06-GR-Leg4	12	1	18	4	2000	60-Bongo-OBL	505	507	507	177220	162344	928124	913339	Yes
FE-00-06-GR-Leg4	13	2	18	4	2000	60-Bongo-OBL	505	2240	548	942788	928131	192021	177213	Yes
FE-00-06-GR-Leg4	14	2	18	4	2000	60-Bongo-OBL	505	2318	643	961190	942788	210852	192021	Yes
FE-00-06-GR-Leg4	15	2	18	4	2000	60-Bongo-OBL	505	2351	607	978891	961190	228948	210862	Yes
FE-00-06-GR-Leg4	16	2	19	4	2000	60-Bongo-OBL	505	23	601	995239	978891	245683	228948	Yes
FE-00-06-GR-Leg4	17	2	19	4	2000	60-Bongo-OBL	505	58	602	8471	995239	259250	245684	Yes
FE-00-06-GR-Leg4	18	2	19	4	2000	60-Bongo-OBL	505	132	518	21228	8471	272023	259253	Yes
FE-00-06-GR-Leg4	19	2	19	4	2000	60-Bongo-OBL	505	202		36333	21228	286908	272023	No
FE-00-06-GR-Leg4	20	2	19	4	2000	60-Bongo-OBL	505	231	509	49872	36333	300394	286908	yes
FE-00-06-GR-Leg4	21	2	19	4	2000	60-Bongo-OBL	505	300	531	65239	49999	315303	300393	yes
FE-00-06-GR-Leg4	22	2	19	4	2000	60-Bongo-OBL	505	328	500	78221	65244	328415	315303	yes
FE-00-06-GR-Leg4	23	2	19	4	2000	60-Bongo-OBL	505	403	500	90703	78222	340663	328420	yes
FE-00-06-GR-Leg4	24	3	19	4	2000	60-Bongo-OBL	505	2158	624	109886	90693	359978	340681	yes
FE-00-06-GR-Leg4	25	3	19	4	2000	60-Bongo-OBL	505	2233	516	125424	109886	375585	359978	yes
FE-00-06-GR-Leg4	26	3	19	4	2000	60-Bongo-OBL	505	2334	512	138862	125423	389246	375584	yes
FE-00-06-GR-Leg4	27	3	20	4	2000	60-Bongo-OBL	505	11		155531	138861	406136	389242	yes
FE-00-06-GR-Leg4	28	3	20	4	2000	60-Bongo-OBL	505	45	540	171338	155531	422136	406136	yes
FE-00-06-GR-Leg4	29	3	20	4	2000	60-Bongo-OBL	505	119	500	186201	171337	437188	422136	yes
FE-00-06-GR-Leg4	30	3	20	4	2000	60-Bongo-OBL	505	153	500	200161	186201	451358	437110	yes
FE-00-06-GR-Leg4	31	3	20	4	2000	60-Bongo-OBL	505	229	645	218109	200160	469432	451356	yes
FE-00-06-GR-Leg4	32	3	20	4	2000	60-Bongo-OBL	505	303	600	234048	218109	485452	469432	yes
FE-00-06-GR-Leg4	33	3	20	4	2000	60-Bongo-OBL	505	336	556	250498	234047	501801	485448	yes
FE-00-06-GR-Leg4	34	3	20	4	2000	60-Bongo-OBL	505	406	510	264327	250493	515444	501801	yes
FE-00-06-GR-Leg4	35	3	20	4	2000	60-Bongo-OBL	505	443	533	278073	264330	529319	515543	yes
FE-00-06-GR-Leg4	36	4	20	4	2000	60-Bongo-OBL	505	2111	507	543236	529335	292160	278168	yes
FE-00-06-GR-Leg4	37	4	20	4	2000	60-Bongo-OBL	505	2200		571311	559207	319870	307962	yes
FE-00-06-GR-Leg4	38	4	20	4	2000	60-Bongo-OBL	505	2222	536	586556	571311	335075	319880	yes
FE-00-06-GR-Leg4	39	4	20	4	2000	60-Bongo-OBL	505	2252	539	603425	586558	351821	335076	yes
FE-00-06-GR-Leg4	40	4	20	4	2000	60-Bongo-OBL	505	2321	602	622691	603423	371041	351820	yes
FE-00-06-GR-Leg4	41	4	20	4	2000	60-Bongo-OBL	505	2350	546	641437	622690	389729	371041	yes
FE-00-06-GR-Leg4	42	4	21	4	2000	60-Bongo-OBL	505	21	504	655580	641436	403758	389730	yes
FE-00-06-GR-Leg4	43	4	21	4	2000	60-Bongo-OBL	505	52	524	669139	655560	417121	403750	yes
FE-00-06-GR-Leg4	44	4	21	4	2000	60-Bongo-OBL	505	125	636	689989	669139	437941	417124	yes
FE-00-06-GR-Leg4	45	4	21	4	2000	60-Bongo-OBL	505	159	500	702464	689989	448929	437945	yes
FE-00-06-GR-Leg4	46	4	21	4	2000	60-Bongo-OBL	505	232	559	720675	702464	466789	448926	yes

Table 3. Summary of Bongo and CTD collections made during FE-00-06-GR-Leg 5

Cruise	Sta	Rep	Day	Mo	Year	Gear	Mesh	Time	Dur	Flow N1 End	Flow1 N1 Beg	Flow N2 End	Flow N2 Beg	CTD
FE-00-06-GR-Leg5	1	BT	24	4	2000	60-Bongo-OBL	505	120	500	494739	483938	748069	738069	Yes
FE-00-06-GR-Leg5	2.2	BT	26	4	2000	60-Bongo-OBL	505	2140	602	483931	466788	738070	721021	Yes[1]
FE-00-06-GR-Leg5	3	BT	26	4	2000	60-Bongo-OBL	505	547	500	504954	494741	758707	748595	Yes
FE-00-06-GR-Leg5	6	BT	26	4	2000	60-Bongo-OBL	505	2322	500	516757	504052	770221	758723	Yes

1 - CTD casts also made at Station 2.1, 2.3, 2.4, 4, and 5 - see Table 5

Three Bongo samples from GRNMS have been sorted and identified. These preliminary data are shown in Table 4. In all, larval gobies are the most abundant and larvae of reef-associated fishes are relatively rare. A large number of eggs were also collected (785, 420 and 1092) at three stations over GRNMS.

Table 4. Identified taxa from three bongo collections made over GRNMS during transect 1, 2 and 3. Number collected are also shown. Identifications are preliminary.

Identified Taxa	Number
Anchoa hepsetus	10
Clupeidae/Engraulidae	5
Ophidion marginatum	2
Syngnathus spp.	1
Prionotus spp.	20
Centropristis spp.?	1
Diplectrum spp.	1
Orthopristis chrysoptera	1
Sparidae	3
Gobiidae	3
Unknown 101 (Gobiidae?)	37
Unknown 103 (Gobiidae)	1
Gobiesocidae?	2
Blennidae	2
Peprilus spp.	1
Etropus crossotus?	4
Damaged	7

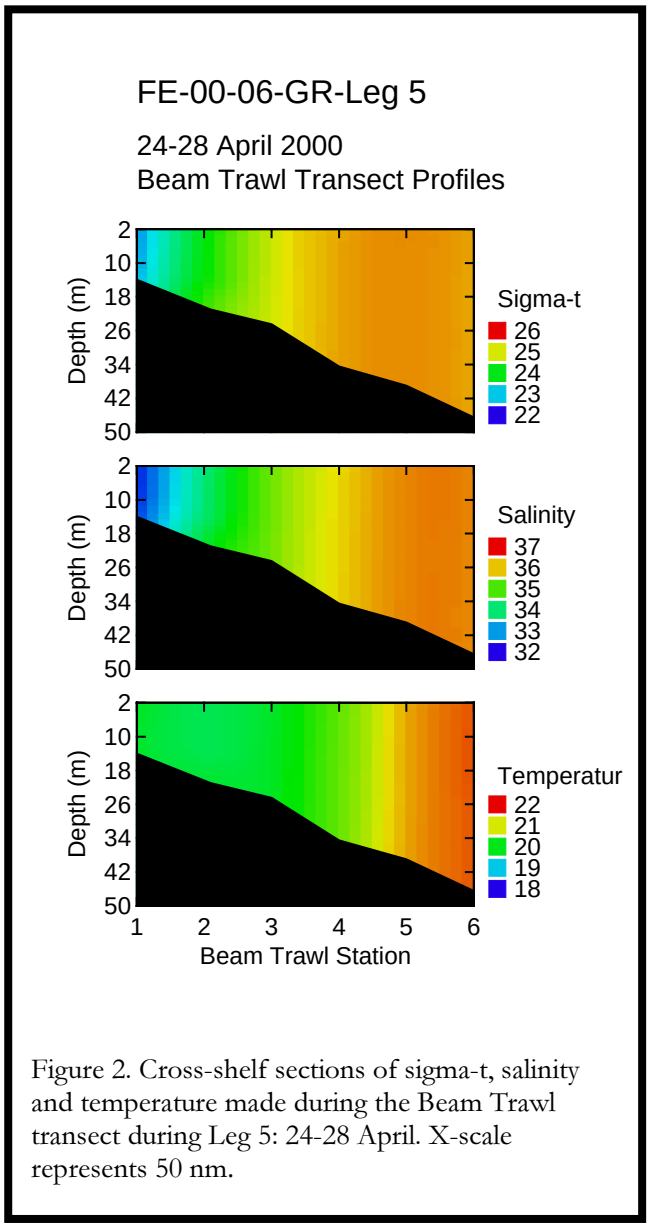


Figure 2. Cross-shelf sections of sigma-t, salinity and temperature made during the Beam Trawl transect during Leg 5: 24-28 April. X-scale represents 50 nm.

CTD Data - A total of 53 CTD casts were made - 46 during Leg 4 and 7 during Leg 5. These are summarized in Table 2 and 3. Data has been processed per the manufacture's protocols. Along-transect profiles are shown in Figure 2-6. Temperature ranged from 18-22°C. Salinity ranged from 32 to 36.6 and sigma-t ranged from 22 to 26. Most of the variability was in the cross-shelf direction rather than in the vertical or along-shelf.

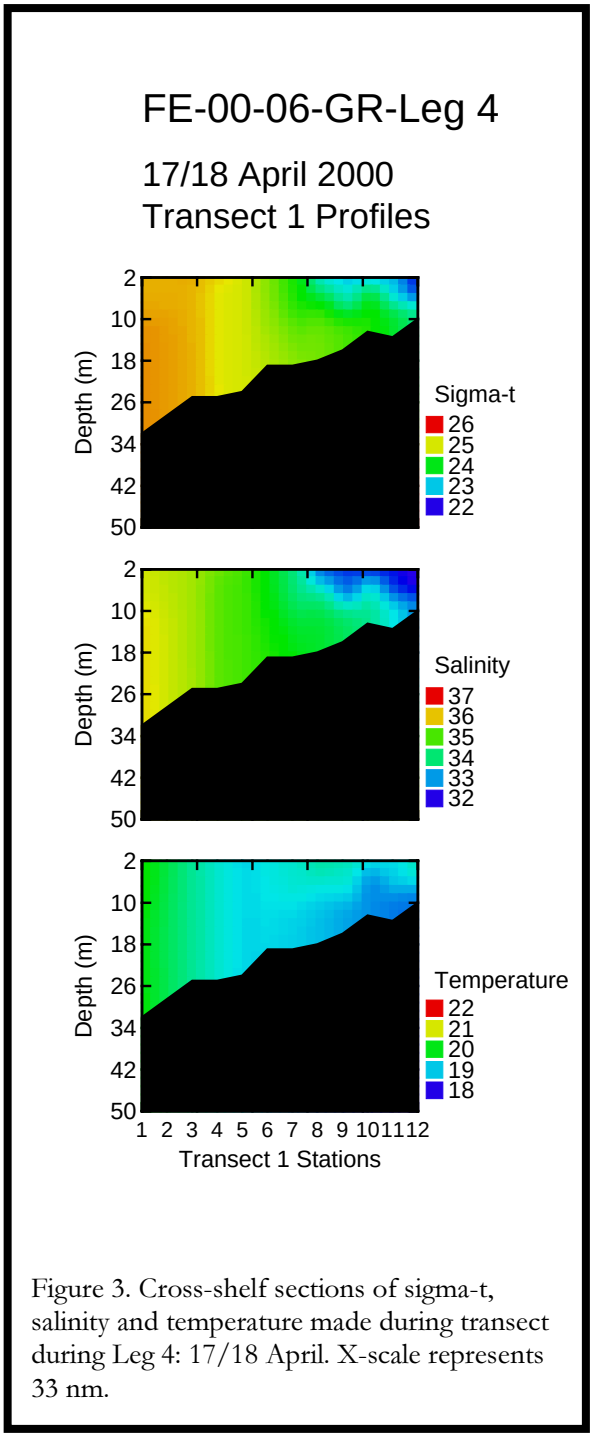


Figure 3. Cross-shelf sections of sigma-t, salinity and temperature made during transect during Leg 4: 17/18 April. X-scale represents 33 nm.

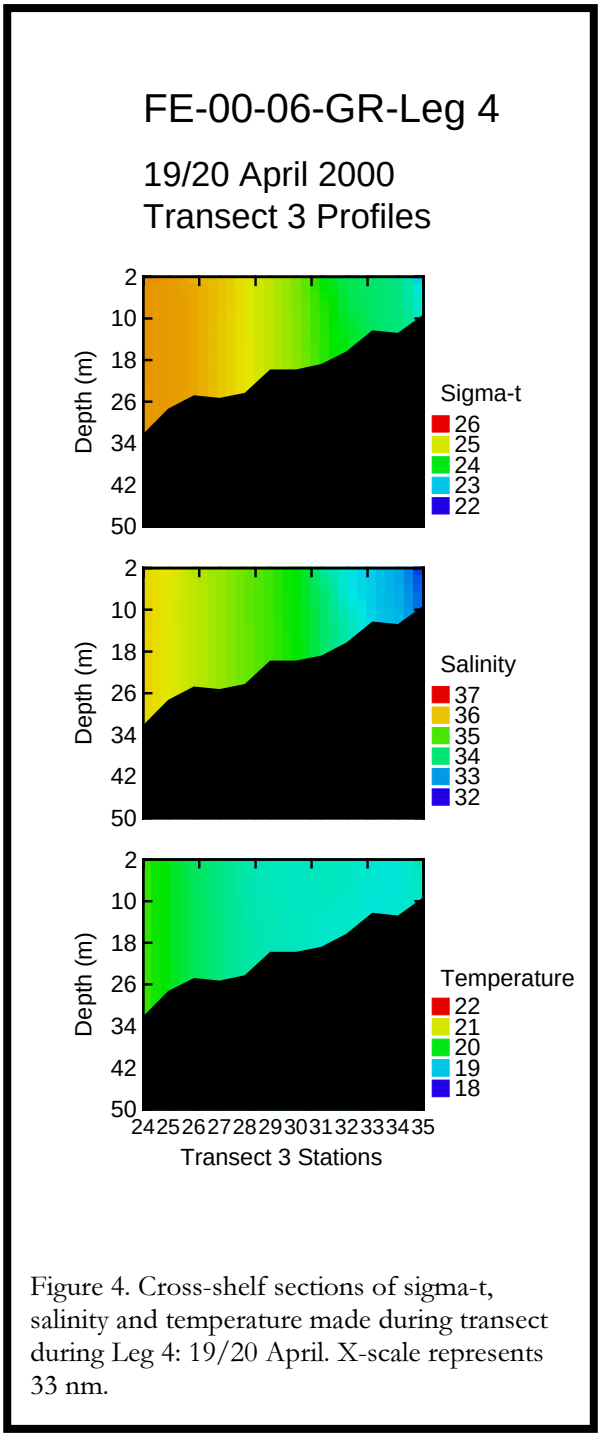


Figure 4. Cross-shelf sections of sigma-t, salinity and temperature made during transect during Leg 4: 19/20 April. X-scale represents 33 nm.

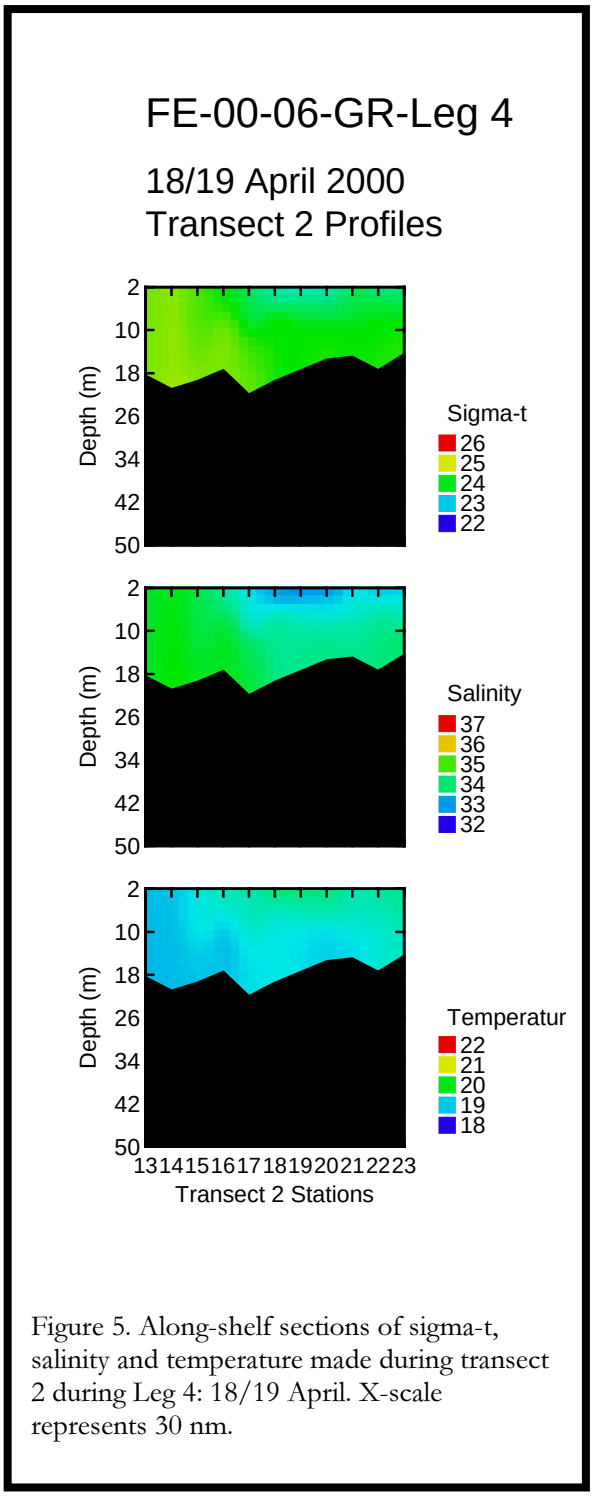


Figure 5. Along-shelf sections of sigma-t, salinity and temperature made during transect 2 during Leg 4: 18/19 April. X-scale represents 30 nm.

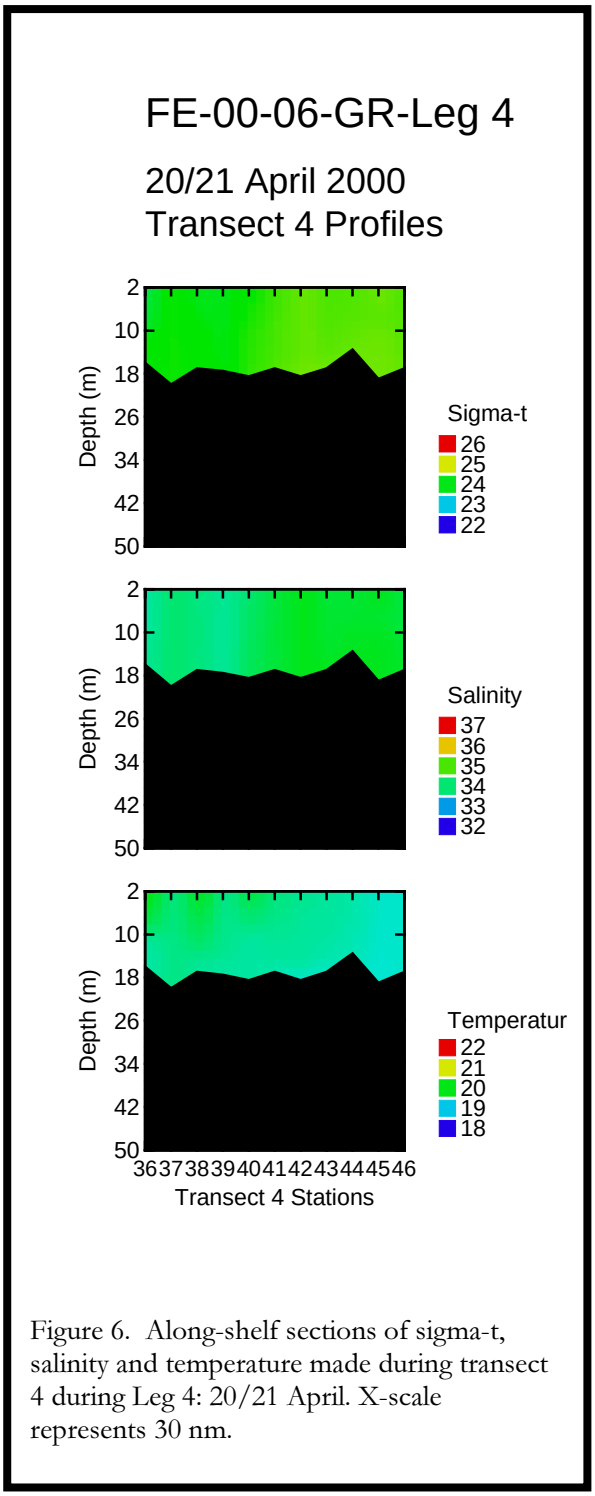


Figure 6. Along-shelf sections of sigma-t, salinity and temperature made during transect 4 during Leg 4: 20/21 April. X-scale represents 30 nm.

ROV Operations - All beam trawl sites except one (BT Sta. 1) were surveyed with the ROV (Table 5). The video will be used to quantify habitat types sampled with the beam trawl.

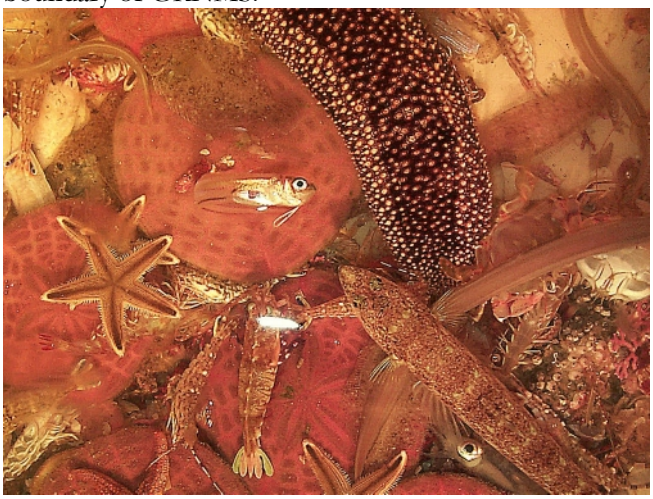
Beam Trawl - 28 beam trawl tows were made at nine sites. A BT station 7 (near the Sapelo Scarp) was planned but weather precluded getting out to this station. A summary of beam trawl and ROV operations in provided in Table 5.

Table 5. Summary of beam trawl and ROV collections made during GR-00-06-Leg 5.

Cruise	Sta	Rep	Day	Mo	Year	Gear	Mesh	Time	Fishing Time	ROV 1 (min)	ROV 2 (min)
FE-00-06-GR-Leg5	2.2	1	24	4	2000	2M Beam trawl	3000	2220	628	15	15
FE-00-06-GR-Leg5	2.2	2	26	4	2000	2M Beam trawl	3000	245	600		
FE-00-06-GR-Leg5	2.2	3	26	4	2000	2M Beam trawl	3000	309	600		
FE-00-06-GR-Leg5	2.2	4	26	4	2000	2M Beam trawl	3000	340	500		
FE-00-06-GR-Leg5	2.3	1	26	4	2000	2M Beam trawl	3000	2306	600	15	15
FE-00-06-GR-Leg5	2.3	2	26	4	2000	2M Beam trawl	3000	2324	500		
FE-00-06-GR-Leg5	2.3	3	26	4	2000	2M Beam trawl	3000	2348	500		
FE-00-06-GR-Leg5	2.4	1	26	4	2000	2M Beam trawl	3000	2141	500	15	15
FE-00-06-GR-Leg5	2.4	2	26	4	2000	2M Beam trawl	3000	2155	500		
FE-00-06-GR-Leg5	2.4	3	26	4	2000	2M Beam trawl	3000	2214	530		
FE-00-06-GR-Leg5	2.1	1	26	4	2000	2M Beam trawl	3000	427	500	15	15
FE-00-06-GR-Leg5	2.1	2	26	4	2000	2M Beam trawl	3000	447	500		
FE-00-06-GR-Leg5	2.1	3	26	4	2000	2M Beam trawl	3000	507	600		
FE-00-06-GR-Leg5	1	1	27	4	2000	2M Beam trawl	3000	148	500		
FE-00-06-GR-Leg5	1	2	27	4	2000	2M Beam trawl	3000	206	500		
FE-00-06-GR-Leg5	1	3	27	4	2000	2M Beam trawl	3000	223	500		
FE-00-06-GR-Leg5	3	1	27	4	2000	2M Beam trawl	3000	439	500	15	15
FE-00-06-GR-Leg5	3	2	27	4	2000	2M Beam trawl	3000	457	500		
FE-00-06-GR-Leg5	3	3	27	4	2000	2M Beam trawl	3000	517	500		
FE-00-06-GR-Leg5	4	1	28	4	2000	2M Beam trawl	3000	554	500	15	15
FE-00-06-GR-Leg5	4	2	28	4	2000	2M Beam trawl	3000	608	500		
FE-00-06-GR-Leg5	4	3	28	4	2000	2M Beam trawl	3000	624	600		
FE-00-06-GR-Leg5	5	1	28	4	2000	2M Beam trawl	3000	317	500	15	15
FE-00-06-GR-Leg5	5	2	28	4	2000	2M Beam trawl	3000	333	500		
FE-00-06-GR-Leg5	5	3	28	4	2000	2M Beam trawl	3000	349	500		
FE-00-06-GR-Leg5	6	1	28	4	2000	2M Beam trawl	3000	2357	500	15	
FE-00-06-GR-Leg5	6	2	28	4	2000	2M Beam trawl	3000	4	500		
FE-00-06-GR-Leg5	6	3	28	4	2000	2M Beam trawl	3000	33	600		

A large number of juvenile fish and macroinvertebrates were collected with the beam trawl (Figure 7). Of interest to this project, small sparids, *Centropristis* and some small wrasses were collected. Additionally, several species of shrimp and some mid-sized juvenile fish predators were also collected (lizardfish, sea robins).

Figure 7. Contents of a beam trawl tow outside the boundary of GRNMS.



Drifter Deployments -Three satellite-tracked drifters were released during Leg 5 in the middle of GRNMS. Drifters were drouged at 10 m with a holey sock and were standard WOCE SVP design (Figure 8).

Figure 8. Satellite-tracked drifter with drouge (red fabric) centered at 10 m. Drifters were released on 26 April and will be tracked for ~60 days.

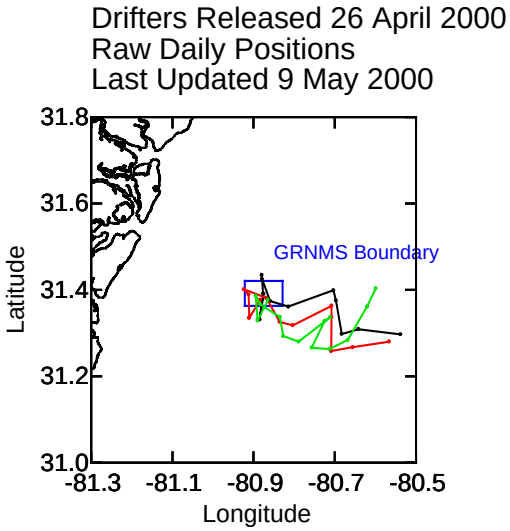


Figure 9. Daily positions of three satellite-tracked drifters.

The drifters remained in the vicinity of GRNMS for ~ 1 week, but then moved westward for much of the second week. The drifters will transmit for 60 days before turning off.

Acknowledgements

We are very grateful to the GRNMS staff for allowing us to participate in the cruise and for making accommodations to their plans to allow our operations to take place. In particular we thank Reed Bohne, Ralph Rogers, Alex Score and Marcy Lee. We are also very thankful to the officers and crew of the NOAA Ship FERREL; their hard work and dedication resulted in a very successful cruise. We also thank those cooperators who participated in our work, Tom Potts, Jim Bohnsack, Jack Javech, and Lance Horne; fish monitoring and ROV operations would not have been possible without their participation.

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